

TECHNICAL SERVICE MANUAL for

MAESTRO®

**PARAMETRIC
FILTER**



Model MPF-320A



2500 Walden Ave.
Buffalo, N.Y. 14225

NORLIN MUSIC
(716) 681-7242

INTRODUCTION

This manual provides servicing and parts information for the Maestro Parametric Filter manufactured by Moog Music Inc., 2500 Walden Avenue, Buffalo, New York 14225. The Maestro Parametric Filter is a tone control device for parametric equalization and controlled distortion for guitar, bass and other electro-acoustical signals.

Input Impedance	1 megohm
Maximum input level for 1% THD	0dBm
Natural mode with HEIGHT control set to 0 and 1kHz sine wave	
Output Impedance	10K ohms
Equivalent Input Noise	
Natural	-88dBm max.
Overdrive	-86dBm max.

FILTER CHARACTERISTICS

BANDWIDTH	FILTER Q	MAXIMUM BOOST OR CUT
Sharp	8.0	±20dB
Medium	1.4	±15dB
Broad	0.3	±12dB
THD in overdrive mode with -20dBm sine wave input		20% THD pre- dominantly 2nd harmonic
Overall Frequency Response (With HEIGHT = 0)		30 to 15kHz ±3dB
Power Requirement		9.0 volts at 750 milliamperes
Recommended Battery Type		NEDA 1604
Estimated Battery Life		300 Hrs.

CIRCUIT DESCRIPTION

The input signal from AXE jack J1 is ac coupled to p-channel MOSFET buffer IC1B. The output of IC1B is coupled to electronic switch IC2C and distortion amplifier IC1A. IC1A is a common-source amplifier with no source degeneration resistor, resulting in approximately 20dB of gain and significant even order distortion. R8, CR1, CR2 and C5 clip the output of IC1A for odd harmonic distortion. The attenuated signal from the junction of R6 and R7 is applied to IC2D.

Electronic switches IC2C and IC2D select between the "Natural" signal from IC1B and the "Overdrive" (distorted) signal from IC1A. The selected signal is routed to IC3A.

IC3A adds pre-emphasis to the input signal. IC3A has a gain of 0dB from dc to 1kHz, a 6dB/octave gain increase from 1kHz to 10kHz and at 10kHz gain levels off to 20dB.

The output of IC3A feeds HEIGHT control at R33. The operation of R33 is easy to understand if a single resistor were connected to the wiper of R33. When the wiper of R33 is on the R32 side, the resistor attenuates the input creating a "cut" (decrease) in output. On the R36 side, the resistor attenuates the feedback of IC3B causing a "boost" (increase) in the output. Of course, instead of a simple resistor, R33 has a frequency dependent impedance consisting of IC4A and IC4B with their associated circuitry. This circuit is an electronic equivalent of a series tuned RLC circuit with variable Q and center frequency. When the wiper of R33 is in the center of the pot, this impedance results in attenuation of the input equal to the gain so the frequency response is flat and overall gain equals 0dB. On the R32 side, the input signal has maximum attenuation (typical series RLC circuit) at the center frequency of the filter so a dip (cut) is formed in the frequency response. On the R36 side, the feedback path on IC3 has minimum feedback at the center frequency so a peak (boost) is formed in the frequency response.

The Parametric Filter element IC4A and IC4B operate under the principle of a voltage controlled impedance. For example, if a 1.0 volt source (A) is connected across a 1 ohm resistor (R), then 1 ampere of current flows. But if a voltage source (B) is connected in series with R and has nine times the amplitude at 180° out-of-phase with (A), then ten times the current flows. Source (A) "sees" resistor (R) as 0.1 ohm instead of 1 ohm. Therefore, the "effective value" of (R) has been changed by the action of B. By changing the amplitude of source B, the effective value of R can be voltage controlled. If the amplitude and/or phase of B is dependent on frequency, then the effective value of R will also depend on frequency and a voltage controlled impedance is formed. Using this technique, a single resistor can appear to be a series tuned RLC network with variable

center frequency and Q. In the Parametric Filter, the voltage controlled impedance element is R34.

IC4A and B operate by the signal from the wiper of R33 routed to SW1 and through a resistor it selects and is then routed through R24 to IC4A. IC4A is a bridge-tee bandpass filter with a high Q and a gain of 40dB at 0° in the passband and a gain of 1 out of the passband. The signal from IC4A is inverted and applied to R34. In the passband of IC4A, R34 has sixteen times the input signal across it, resulting in R34 having an "effective value" of 200 ohms. As the signal frequency moves away from the passband, the signal across R34 decreases and the effective value of R34 increases. R35 and R29 bootstraps the output of IC4B at frequencies out of the passband allowing the effective value of R34 to approach infinity.

Therefore, R34 has a low impedance in the filter passband and high impedance elsewhere. This is identical to a series tuned RLC circuit. R23 adjusts the filter center frequency without affecting Q or gain. SW1 changes the Q and gain of the filter without altering the center frequency. At switch 1 or 5 (Sharp, High Q), R38 and R39 are shorted out and switch IC2B is turned on. R20 is connected to ground, minimizing negative feedback around the loop resulting in high Q. In position 2 or 4 (MEDIUM Q), R39 is connected in series with R34, switch IC2A is turned on and IC2B is turned off. R39 sets the minimum effective value of R34 setting the maximum available cut or boost to a value lower than a high Q. Switching R18 in place of R20 increases the negative feedback around IC4A, decreasing Q. In switch setting 3 (BROAD), R38 and R39 are placed in series with R34, further reducing the maximum available cut or boost. Both IC2A and IC2B are turned off providing maximum negative feedback and minimum Q.

The cut or boosted output of IC3B is de-emphasized by R37 and C18. The de-emphasis fre-

quency is higher than the pre-emphasis frequency resulting in a mid-range boost even when the HEIGHT is set in the flat position. IC1C, R12, R13 and R14 form an inverter with low output impedance. The output signal is ac coupled to stomp switch SW2.

With no plug in the AUX output jack J2, SW2 switches the straight signal or the parametric signal to the main output. With a plug in the AUX jack J2, the straight signal is switched to the AUX jack and in the other position, the parametric signal is connected to the AMP jack J3.

SW1 is connected to Quad NAND gate IC5 which feeds electronic switch IC2. A summary of the switch function is outlined below.

DISASSEMBLY

a) Pull out plungers on battery holder assembly (1, Figure 1) and remove battery holder assembly. Disconnect battery (2) if present and remove.

b) Loosen setscrews (3) securing dial assemblies (4 and 5) by inserting a 1/16-inch Allen wrench through holes in dial assemblies and remove dial assemblies. Lift off foot control assembly (6).

c) Remove nut (7) using a 1/2-inch nut driver, lock washer (8), three screws (9) and screw (10) and remove both end caps.

CAUTION

Do not set Maestro Parametric Filter on its side when removing second end cap as damage to rotary pot shaft may result.

d) Position Maestro Parametric Filter face down and carefully slide hinge assembly (12) out of housing

UNIT MODE	FILTER Q	IC2A	IC2B	IC2C	IC2D
Overdrive	Sharp	Off	On	Off	On
Overdrive	Medium	On	Off	Off	On
Natural	Broad	Off	Off	On	Off
Natural	Medium	On	Off	On	Off
Natural	Sharp	Off	On	On	Off

ELECTRONIC SWITCH OPERATION

assembly (25) making certain spring (13) around push switch assembly (17) does not fly off and remove spring.

e) Disconnect three pin connector on printed circuit board assembly (16) noting black wire on left side of connector.

f) Remove nuts (14) using a half inch nut driver and flat washers (15) from AXE, AMP and AUX jacks and carefully remove printed circuit board assembly (16).

g) Remove ring nut (18), flat washers (19) and lock washer (20) and slide out push switch (22) lock washer and hex ring.

h) Slide foot pads out of their channels if replacement is required.

TEST AND TROUBLESHOOTING

a) Visually inspect the unit for broken wires, damaged components, loose connections and other obvious defects.

b) Make certain unit is connected and operated according to Owner's Manual or instruction label located on bottom of unit. If possible, check associated equipment such as cables, battery or amplifier used with the unit.

c) Connect 9 volt dc power source to battery and turn FREQ to 500 Hz and HEIGHT pot to maximum output level.

d) Apply a 200 millivolt peak-to-peak sine wave at a frequency of 500 Hz to AXE jack J2 and observe dc voltage levels and ac signal levels as shown on the schematic diagram using an oscilloscope. Ensure proper operation of HEIGHT and FREQ controls.

NOTE

A high impedance voltmeter (1 megohm per volt or higher) may be used to measure dc voltage levels. Note that voltage levels and waveforms displayed on the schematic diagram are not absolute values as readings may vary between units.

e) Once the problem is localized, check the suspected part by direct substitution if possible. Otherwise use a voltmeter or oscilloscope to determine the malfunctioning part.

NOTE

All replacement parts may be obtained from Moog Music Inc. However, many standard electronic parts may be obtained locally in less time than is required to receive them from Moog. When purchasing replacement parts locally, check the parts list for proper value, tolerance and rating.

REASSEMBLY

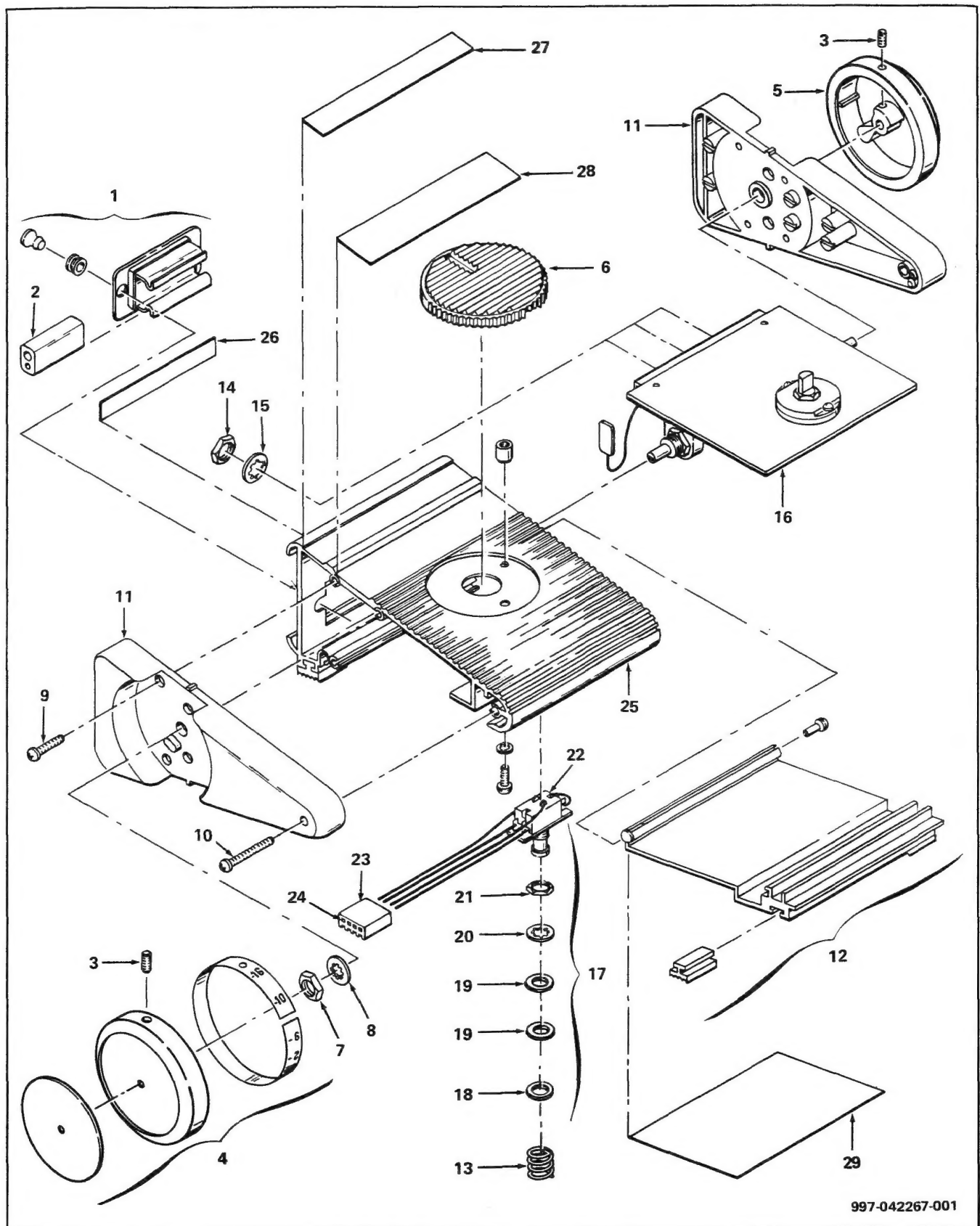
a) Reassemble Maestro Parametric Filter in reverse order of disassembly referring to the exploded view (Figure 1) and noting the following additions.

b) Finger tighten nuts (14 and 15) securing printed circuit board assembly (16) to housing assembly (25) to allow printed circuit board assembly to fit into slots of end caps (11). After both end caps are installed, tighten nuts (14 and 15).

c) Connect five pin connector (23) to printed circuit board assembly (16) making certain red wire (pin 1) is on left side of connector at bottom of printed circuit board.

d) Slip dial assemblies (4 and 5) on rotary pot shafts (left dial assembly (4) marked "L" between "9" and "0" and right dial assembly (5) marked "R" between "9" and "0") and turn each dial assembly full counterclockwise and then clockwise.

e) Turn right dial assembly full counterclockwise. Holding dial assembly steady at "0", insert small screwdriver in hole at center of dial assembly and turn pot shaft full counterclockwise then approximately five degrees clockwise to relieve strain on pot shaft. Tighten setscrew (3).



997-042267-001

FIGURE 1 PARAMETRIC FILTER EXPLODED VIEW

f) Turn left dial assembly full clockwise. Holding dial assembly steady at "0", insert small screwdriver in hole at center of dial assembly and turn pot shaft full clockwise, then five degrees counterclockwise to

relieve strain on pot shaft. Tighten setscrew (3).

g) Rotate both dial assemblies making certain their range is from "0" to "9".

REPLACEMENT PARTS LISTS

ORDERING

The following lists specify parts available from Moog Music Inc., Customer Service Department, 2500 Walden Avenue, Buffalo, New York 14225, (716) 681-7242. Please specify the unit name, model, serial number, part description, electrical reference designator, if applicable, and part number when ordering.

MAESTRO PARAMETRIC FILTER REPLACEMENT PARTS LIST

INDEX NO.	PART NUMBER	DESCRIPTION	QTY
Figure 1	997-042267-001	Maestro Parametric Filter consisting of:	
1	997-040040-001	Battery Holder Assembly, consisting of:	1
	964-040004-001	Battery Holder.	1
	930-040044-001	Plunger	2
	930-040043-003	Grommet	2
2		Battery, 9 volt, NEDA 1604	Ref
3	903-040486-061	Setscrew, No. 6-32 x 5/16 lg. Cup Point (Clad Plate)	1
4	997-042275-001	Dial Assembly, Left Side, consisting of:	1
	964-040020-001	Dial	1
	913-042268-001	Decal, Dial, Left Side	1
	913-040046-001	Decal, Disc.	1
5	997-042275-002	Dial Assembly, Right Side, consisting of:	1
	964-040020-001	Dial	1
	913-042268-002	Decal, Dial, Right Side	1
	913-040046-001	Decal, Disc.	1
6	997-040118-001	Foot Control Assembly, consisting of:	1
	914-040114-002	Foot Control Top	1
	913-040395-001	Decal, Pointer	1
	976-040117-001	Spring, Knob	1
	964-040055-002	Knob, Foot Control	1
7	902-040504-007	Nut, 3/8-32	2
8	904-040065-003	Lock Washer, 3/8 Int.	2
9	811-040039-010	Screw, Self Tapping, No. 6A x 5/8 lg.	6
10	811-040032-016	Screw, Self Tapping, No. 6A x 1 lg.	2
11	968-040009-001	End Cap, Die Cast	2
12	997-040099-001	Hinge Assembly, consisting of:	1
	968-040014-003	Hinge Extrusion	1
	916-040021-001	Foot Pad	2
	905-040045-003	Rivet, Nylon	2
13	975-040128-001	Spring, Compression	1
14	902-040504-007	Nut, Hex, 3/8-32	5
15	904-040065-003	Washer, Lock, 3/8	2
16	996-042213-001	Printed Circuit Board Assembly (Refer to Figure 2)	1
17	997-042274-001	Switch Assembly, Stomp, consisting of:	1
18	902-041442-007	Ring Nut (15/32" Bushing)	Ref

MAESTRO PARAMETRIC FILTER REPLACEMENT PARTS LIST (Continued)

INDEX NO.	PART NUMBER	DESCRIPTION	QTY
19	904-041495-006	Flat Washer (15/32 Bushing)	2
20	904-040065-005	Lock Washer (15/32 Bushing) Int. Tooth	1
21	902-040504-006	Hex Nut (15/32 Bushing)	Ref
22	960-040042-001	Push Switch, DPDT	1
23	910-041714-005	Terminal Housing, 5 Position	1
24	910-041720-001	Pin	5
25	997-040097-001	Housing Assembly, consisting of:	1
	968-040013-006	Housing Extrusion	1
	916-040021-001	Foot Pad	2
	806-045039-004	Screw, No. 6-32 x 1/4 lg	1
	904-040495-016	Lock Washer, No. 6	1
	973-040508-040	Spacer, No. 6-32 x 3/16 lg	1
		Push Switch Assembly (See 17, Figure 1)	Ref
		Hinge Assembly (See 12, Figure 1)	Ref
26	913-042272-001	Decal, AXE-AMP-AUX	1
27	913-042270-001	Decal, MAESTRO PARAMETRIC FILTER	1
28	913-042269-001	Decal, Filter Bandwidth	1
29	913-042271-001	Instruction Label, Parametric Filter	1
	993-042276-001	Owner's Manual	1

PRINTED CIRCUIT BOARD REPLACEMENT PARTS LIST

INDEX NO. OR REF DESIG	PART NUMBER	DESCRIPTION	QTY
Figure 2	996-042213-001	Printed Circuit Board Assembly, consisting of:	
1	980-042212-002	Printed Circuit Board	1
2	967-040019-001	Angle Bracket	1
3	905-042027-004	Tubular Rivet, Oval Head	2
4	904-040065-014	Lockwasher, 3/8 Int. Tooth	3
5	935-041601-001	Battery Clip, 9 Volt	1
C1, C2	946-041978-223	Capacitor, Polyester, 0.022 uf	2
C3	946-040231-002	Capacitor, Tantalum, 10 uf/50V	1
C4, C19 thru C23	947-040200-103	Capacitor, Disc, 0.01 uf	6
C5, C7, C8, C11	945-040209-005	Capacitor, Alum., Elec. 2.2 uf/50V	4
C6	946-041978-104	Capacitor, Polyester, 0.1 uf	1
C9, C10	946-041978-224	Capacitor, Polyester, 0.22 uf	2
C12, C15	945-040209-001	Capacitor, Alum., Elec., 10 uf/25V	2
C13	946-041978-122	Capacitor, Polyester, 0.0012 uf	1
C14	946-041978-394	Capacitor, Polyester, 0.39 uf	1
C16	946-041978-153	Capacitor, Polyester, 0.015 uf	1
C17	947-042020-101	Capacitor, Disc, 100 Pf	1
C18	946-041978-103	Capacitor, Polyester, 0.01 uf	1
C24	947-042020-501	Capacitor, Disc, 500 Pf	1
CR1 thru CR3	919-041075-001	Diode, 1N4148 (Alt. 1N914)	3

PRINTED CIRCUIT BOARD REPLACEMENT PARTS LIST (Continued)

INDEX NO. OR REF DESIG	PART NUMBER	DESCRIPTION	QTY
IC1	991-041086-001	Integrated Circuit, CMOS, CD4007AE	1
IC2	991-041087-001	Integrated Circuit, CMOS, CD4016AE	1
IC3	991-041209-001	Integrated Circuit, SN72L022P	1
IC4	991-041209-001	Integrated Circuit, SN72L022P	1
IC5	991-041088-001	Integrated Circuit, CMOS, CD4011AE	1
J1	910-041306-004	Jack, Phone, 2 Circuit, AXE	1
J2	910-041306-002	Jack, Phone, Shorting, AUX	1
J3	910-041306-001	Jack, Phone, 1 Circuit, AMP	1
P1	910-041803-005	Connector, Straight, 5 Position	1
R1	852-312335-001	Resistor, 3.3 Megohm, $\pm 5\%$, 1/4W	1
R2, R4, R25, R26	852-312225-001	Resistor, 2.2 Megohm, $\pm 5\%$, 1/4W	4
R3, R9	852-312333-001	Resistor, 33K Ohms, $\pm 5\%$, 1/4W	2
R5	852-312475-001	Resistor, 4.7 Megohm, $\pm 5\%$, 1/4W	1
R6, R27, R29, R31	852-312223-001	Resistor, 22K Ohms, $\pm 5\%$, 1/4W	4
R7	852-312562-001	Resistor, 5.6K Ohms, $\pm 5\%$, 1/4W	1
R8	852-312222-001	Resistor, 2.2K Ohms, $\pm 5\%$, 1/4W	1
R10 thru R12, R30, R37, R45	852-312103-001	Resistor, 10K Ohms, $\pm 5\%$, 1/4W	6
R13	852-312114-001	Resistor, 110K Ohms, $\pm 5\%$, 1/4W	1
R14, R17, R40 thru R44	852-312104-001	Resistor, 100K Ohms, $\pm 5\%$, 1/4W	7
R15, R16, R19, R46 thru R49	852-312105-001	Resistor, 1 Megohm, $\pm 5\%$, 1/4W	7
R18	852-312203-001	Resistor, 20K Ohms, $\pm 5\%$, 1/4W	1
R20	852-312472-001	Resistor, 4.7K Ohms, $\pm 5\%$, 1/4W	1
R21, R22	852-312162-001	Resistor, 1.6K Ohms, $\pm 5\%$, 1/4W	2
R23	925-042260-001	Resistor, Rotary Pot, Dual FREQUENCY, AUDIO, 100K Ohms	1
R24	852-312433-001	Resistor, 43K Ohms, $\pm 5\%$, 1/4W	1
R28	852-312102-001	Resistor, 1K Ohms, $\pm 5\%$, 1/4W	1
R32, R36	852-312202-001	Resistor, 2.0K Ohms, $\pm 5\%$, 1/4W	2
R33	925-042259-001	Resistor, Rotary Pot, S Taper HEIGHT, 10K Ohms	1
R34	852-312332-001	Resistor, 3.3K Ohms, $\pm 5\%$, 1/4W	1
R35	852-312153-001	Resistor, 15K Ohms, $\pm 5\%$, 1/4W	1
R38, R39	852-312331-001	Resistor, 330 Ohms, $\pm 5\%$, 1/4W	2

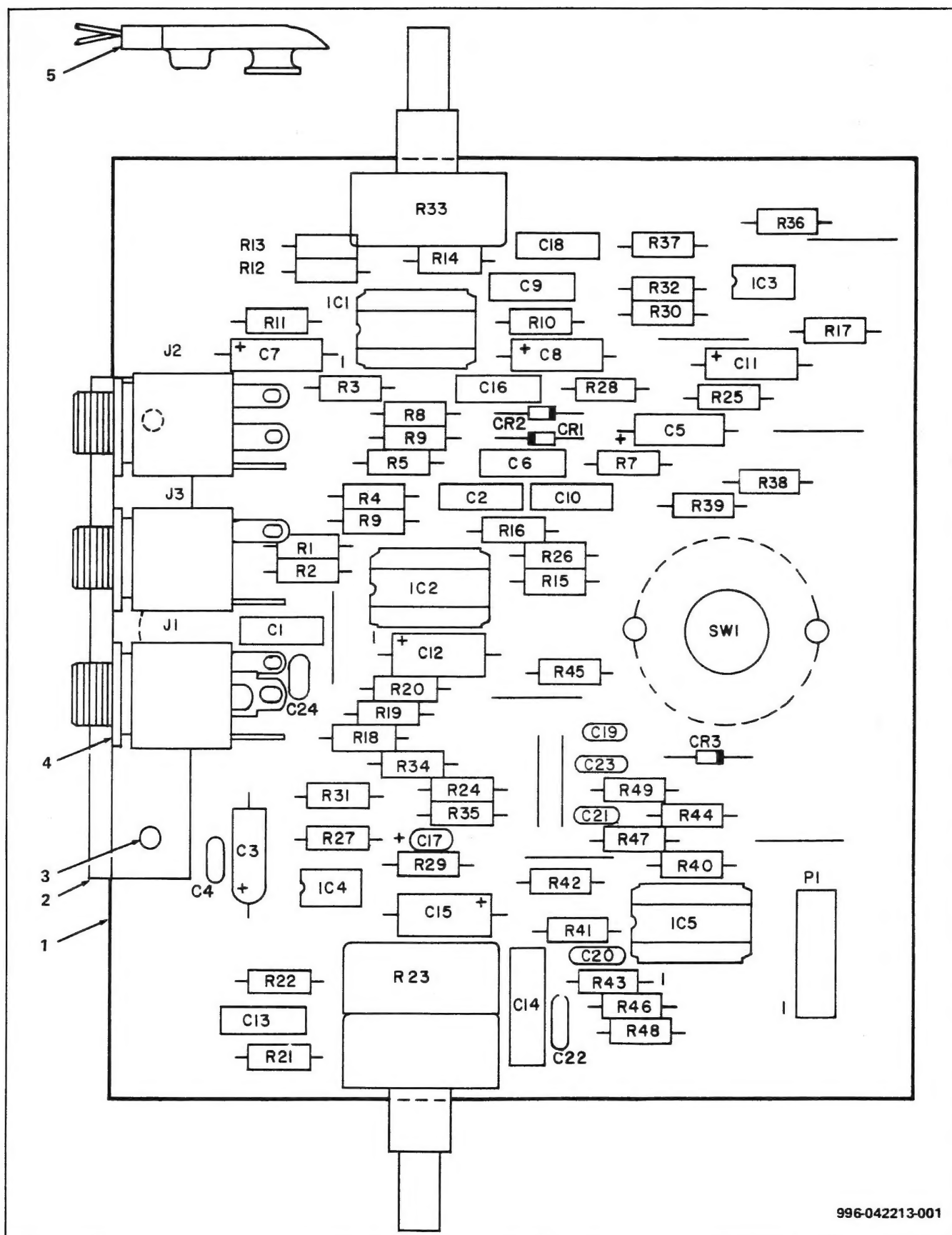
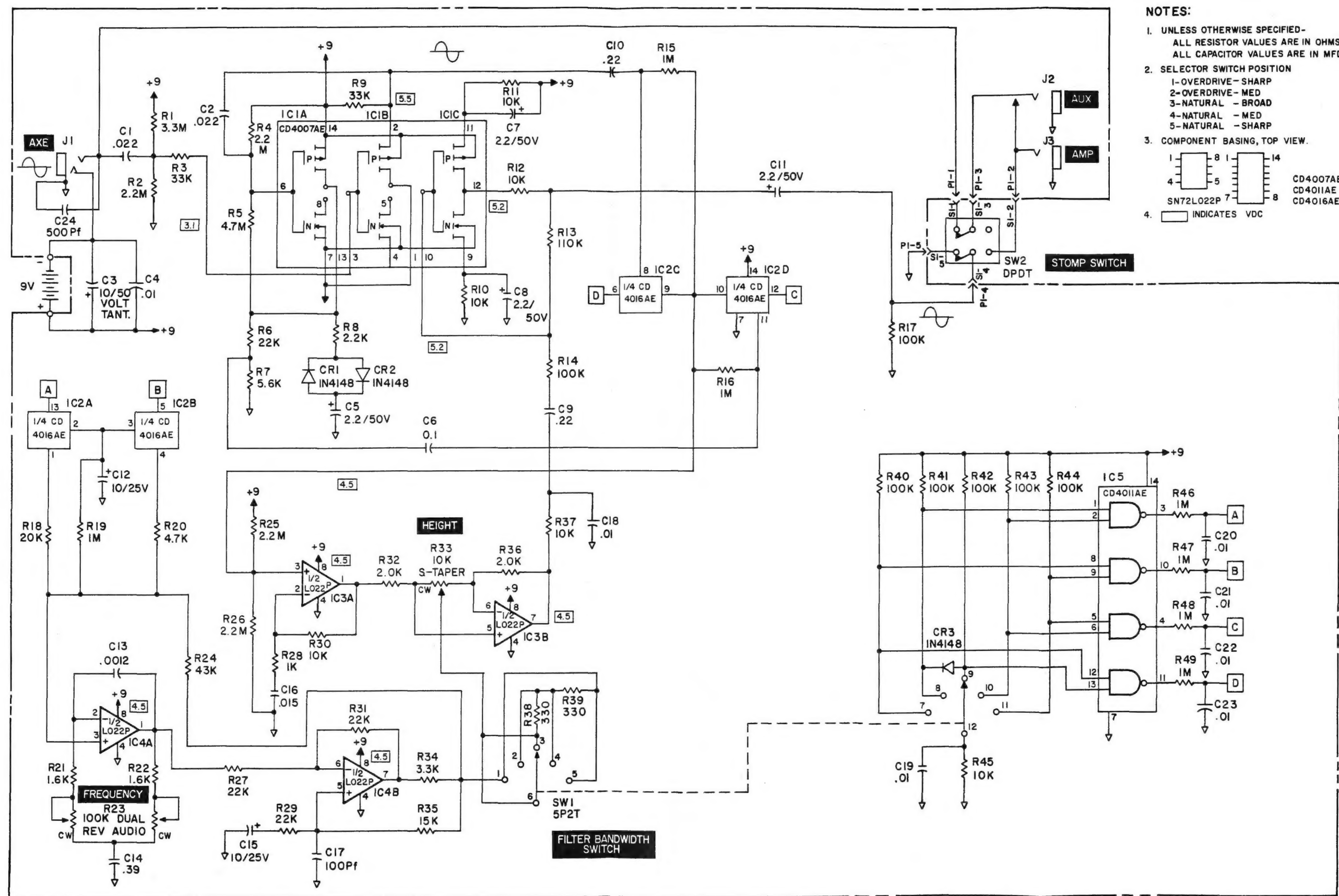


FIGURE 2 PARAMETRIC FILTER PRINTED CIRCUIT BOARD ASSEMBLY



NOTES:

- UNLESS OTHERWISE SPECIFIED-
ALL RESISTOR VALUES ARE IN OHMS 1/4W, $\pm 5\%$
ALL CAPACITOR VALUES ARE IN MFD (μf).
- SELECTOR SWITCH POSITION
1-OVERDRIVE-SHARP
2-OVERDRIVE-MED
3-NATURAL-BROAD
4-NATURAL-MED
5-NATURAL-SHARP
- COMPONENT BASING, TOP VIEW.

1	8	14	CD4007AE
4	5	8	CD4011AE
7	8	8	CD4016AE
- INDICATES VDC

993-042210-001



MAESTRO FUZZTAIN
MODEL MFZT - 272A
MANUAL NO. 993-040659-001



MAESTRO STAGE PHASER
MODEL MPP - 274A
MODEL MSP - 274A
MANUAL NO. 993-040660-001



MAESTRO PHASER
MODEL MP - 273A
MANUAL NO. 993-040658-001

MAESTRO FUZZ
MODEL MFZ - 271A
MANUAL NO. 993-040657-001



PARAMETRIC FILTER

Another Quality Product from Norlin

MOOG MUSIC INC.

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NORLIN MUSIC

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